# *Pioneer* Mission Support

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*The DSN plans to use the Mark III system configuration for the tracking and data acquisition support for the Pioneer F and G mission. As a continuation of the description of the network systems, the configurations of the simulation, monitoring, and operations control systems are given. Block diagrams show the planned functions, data flow methodology and the interfaces between the subsystems and the three DSN facilities.*

## I. Introduction

Continuous reports published in previous issues of the DSN Progress Report (Refs. 1–4) contained a description of the *Pioneer F* and *G* mission profile, spacecraft, conical scanning system (CONSCAN), and the specific objectives of the scientific instrumentation. Special emphasis was given on the elaboration of mission characteristics which interface with the tracking and data acquisition functions.

The functional configuration, data flow methodology, and interfaces of the simulation, monitoring, and operational control systems of the Mark III DSN are presented.

## II. DSN Simulation System

The purpose of the DSN simulation system is to create realistic simulation of expected operational environments for testing and training to prepare the DSN and its users for support of planned missions. This system also provides a capability for DSN and spacecraft failure mode isolation. The DSN simulation system is described in Fig. 1.

## III. DSN Monitor System

This system provides the capability for sensing strategic characteristics of the various elements of the DSN, processing, displaying the data for use by DSN operations personnel, and for storing data for later analysis or reference. Monitor data are used for determining DSN status and configurations, for guidance in the direction of operations, for furnishing alarms of nonstandard conditions, and for analysis of the quantity and quality of data provided to the flight project.

The DSN monitor system as it will exist at the SFOF, GCF, and DSSs 12, 14, 41, 51, and 62 is described in Fig. 2. This implementation plan utilizes the DIS II (16-K core) of the DSIF. Figure 3 presents the DSN monitoring system configuration as planned for the SFOF, GCF, and DSSs 11, 42, and 61.

## IV. DSN Operations Control System

This system is the mechanism necessary for directing the operations of the DSN facilities and systems in support of flight projects. The functions of operations control are affected by both the DSN operations chief and the facility chiefs. Plans and procedures assure coordination and provide real-time direction in the event of anomalous conditions so that optimum support to flight projects is provided. The operations control functions are: operating the network, scheduling, discrepancy reporting, sequence-of-events generation, master data records production, and operational document control. The DSN operations control system is described in Fig. 4.

## References


1. Siegmeth, A. J., "*Pioneer* Mission Support," in *The Deep Space Network Progress Report*, Technical Report 32-1526, Vol. II, pp. 6–17. Jet Propulsion Laboratory, Pasadena, Calif., April 15, 1971.
2. Siegmeth, A. J., "*Pioneer* Mission Support," in *The Deep Space Network Progress Report*, Technical Report 32-1526, Vol. III, pp. 7–19. Jet Propulsion Laboratory, Pasadena, Calif., June 15, 1971.
3. Siegmeth, A. J., "*Pioneer* Mission Support," in *The Deep Space Network Progress Report*, Technical Report 32-1526, Vol. IV, pp. 13–21. Jet Propulsion Laboratory, Pasadena, Calif., Aug. 15, 1971.
4. Siegmeth, A. J., "*Pioneer* Mission Support," in *The Deep Space Network Progress Report*, Technical Report 32-1526, Vol. V, pp. 4–16. Jet Propulsion Laboratory, Pasadena, Calif., Oct. 15, 1971.

## Table 1. DSN Simulation system (Fig. 1)

EQUIPMENT/SUBSYSTEM CAPABILITIES

Ⓐ High-speed data line is full duplex, one per DSS

SOFTWARE CAPABILITIES

ⓐ *DSS Simulation Conversion Assembly (SCA), 910 Real-Time Program (Control from DSN Simulation Center)*

A. *Input Processing*

1. Input process message blocks from one high-speed data (HSD) line, with contents listed in ①

B. *Output Processing*

1. Output process simulated Pioneer telemetry on Channel No. 1. Encoding to be switched in as required by control message. (Three additional output channels available as alternates, but only for uncoded data.)
2. Output process bit rate control, subcarrier frequency control, modulation index control, and carrier attenuation control.

ⓑ *DSS SCA 910 Data Generation Program (Local Control)*

A. *Input Processing*

Input process operator controls and initialization

B. *Internal Processing*

Generate telemetry data patterns and attenuation control data according to operator controls and initialization

C. *Output Processing*

1. Output process telemetry data stream
2. Output process bit rate control, subcarrier frequency control, modulation index control, and attenuation control according to operator inputs

ⓒ *6050 Computer Program (DSN supplied)*

A. *Input Processing*

Input process:

1. Spacecraft math model data from the 1108
2. Spacecraft position as a function of time, in terms of station centered angles, range rates, and range from phi-factor tape obtained from 360/75 PREDICTS Program
3. DSS parameters which can be affected by the spacecraft condition. (Used for transmission to SCA in long-loop and to vary Monitor data in short-loop)
4. All HSD from up to three DSSs, when in long-loop mode, discarding all but command data, monitor data, and SCA display messages
5. All HSD to three (maximum) DSSs from SFOF, disregarding all but command system and standards and limits traffic (short-loop mode only)
6. Processing control messages for 6050 or 1108 and display-control messages

B. *Output Processing*

Output process and format:

1. HSD as listed in ① and ② for up to three DSSs
2. TTY tracking data as listed in ④
3. Displays of system status and selected data
4. Processing control messages to 1108
5. Anticipated and actual commands to 1108

C. *Internal Processing*

1. Generate telemetry data streams (any rate) correctly formatted (frame sync words, etc.), but with controllable-pattern data values
2. Store the decommutated telemetry data received from the 1108 for construction of HSDA message blocks
3. Generate tracking data, based upon PREDICTS phi-factor tape input, for up to three DSSs. Effect a maneuver response in the data under input control of maneuver parameters
4. Generate DSS responses, in terms of command and monitor system data, when in the short-loop mode
5. Generate DSS parameters which may vary with change in spacecraft or DSS conditions

ⓓ *1108 Program (Project-supplied)*

A. *Input Processing*

Input Process:

1. Program control (including initialization and inputting of constants) from 6050 or 1108 I/O console
2. Anticipated or actual commands from 6050

B. *Output Processing*

Output process:

1. Spacecraft commutated telemetry output
2. Spacecraft parameters which affect DSS status
3. Spacecraft parameters which affect tracking data

C. *Internal Processing*

1. Generate with math models command responsive telemetry at any Pioneer data rate

## Table 2. DSN monitoring system (Fig. 2)

EQUIPMENT/SUBSYSTEM CAPABILITIES

Ⓐ Located in DSN Operations Area of SFOF

Ⓑ One 4800-bps full-duplex line, per DSS, shared by all systems; 1200-bit block size

SOFTWARE CAPABILITIES

ⓐ *DSIF Monitor System Phase II Program*

A. *Input Processing*

Input process:

1. Tracking parameter values and indicator settings from TDH-1[a] for one spacecraft consisting of the following:
   (a) Hour angle and declination angle
   (b) Doppler counts from counter
   (c) Range units
   (d) Exciter voltage-controlled oscillator (VCO) reference frequency
   (e) Doppler resolver time
   (f) Tracking data sample rate
   (g) Doppler, angle, and range data condition codes
   (h) Station ID
   (i) Spacecraft ID
   (j) Pass number
2. Input process DSS telemetry system monitor data from all TCP computers via the 24-bit parallel registers.
3. Parameter values and indicator settings associated with station hardware configuration for one or two spacecraft:
   (a) SDA parameters and indicators
   (b) Receiver parameters and indicators including doppler and range indicators
   (c) Cassegrain and acquisition aid, right or left circular polarization indicators
   (d) Antenna servo modes
4. DSS command system monitor data from all TCP computer via the 24-bit parallel registers.
5. Instrumentation parameter values consisting of:
   (a) Ground AGC and SPE values
   (b) Transmitter power
6. Time for labeling
7. Predicts and operations data received via HSDL from SFOF
8. Operator messages
9. Servo angle error values, antenna pointing subsystem (APS) modes and status, and angle data condition from APS computer program
10. Selected GCF HSD monitor data from DSS Comm equipment subsystem

B. *Output Processing*

Output process and format:

1. Parameter values and indicator settings (full DSS status) into HSD blocks for transmission to the SFOF 360/75s every 5 s
2. Selected monitor parameters and alarms to the station manager console area on a DTV display
3. Digital instrumentation subsystem (DIS) operator control messages to a page printer
4. Digital recording of monitor HSD blocks; capable of replay, postpass.
5. Page prints of predicts and operations data
6. Magpak recording of predicts

C. *Internal Processing*

1. The following calculations are made for the tracking system:
   (a) Compute doppler measurement in counts per time unit
   (b) Compute doppler residuals using predicts and compute mean and standard deviation of the residuals
   (c) For alarm purposes, compare criteria data with selected tracking data, and compute mean and standard deviation for angle residuals
   (d) Calculate doppler alarm limits from least squares or Lagrangian extrapolation, and perform blunder point alarm calculation using supplied limits
   (e) Calculate range residual, range mean and standard deviation
   (f) Calculate noise detection range parameter for range rejection
2. The following calculations are made for the monitor system:
   (a) Convert DSS static phase error (SPE) from volts to degrees
   (b) Convert RF angle errors from volts to degrees when angle channels have been calibrated
   (c) Convert transmitter power from volts to kilowatts
   (d) Register GCF (station comm) alarm occurrence; reset after each HSDA block output to DSN Monitor in SFOF

ⓑ *Communication Processor Program, Monitor portion*

In addition to its primary function of automatic message switching for TTY circuits, the following monitor functions are performed by the CP program:

A. *Input Processing*

Input process:

1. Operator Commands which control and direct HSD Line monitoring
2. Parameters which are received for each HSDA line being monitored. The signals are generated by GCF error detection decoders on the HSD Lines and are passed to a teletype character generator which outputs TTY characters to the GCF communications processor (CP).

B. *Output Processing*

Output process and format:

1. Data blocks to each active 360/75 comprised of the following:
   (a) The on-line CP and its busy rate
   (b) The mode of the off-line CP
   (c) Accounting information and status on each HSDA line monitored
2. Data to the digital TV for each HSDA line being monitored
3. Advisory messages to the CP operator when the carrier ON/OFF status changes for a HSD line being monitored
4. Account blocks for each HSDA line to the CP log tape and to the 360/75 on termination of a monitoring period

## Table 2 (contd)

C. *Internal Processing*

1. The CP calculates the time it is actively processing data as a percentage of time available for such processing in a given period (busy rate)
2. The following internal calculations are performed by each HSD line monitored:
   (a) Error rate
   (b) Total amount of carrier off time
   (c) Number of null sample periods
   (d) Total number of sample periods

© *The 360/75 DSN Monitor Real Time (RT) Software*
*Part I—Collection and Processing of Monitor Data for Real-Time Display*

A. *Input Processing*

Input process:

1. HSD blocks containing DSIF and station command monitor data: Parameter values, and indicator settings every 5 seconds, summary data every 30 seconds
2. GCF monitor messages from SFOF communications terminal subsystem via normal input lines from the CP
3. Operator messages input from the DSN monitor area
4. MCD set generation, modification and storage (see following Part III)

B. *Output Processing*

1. *Output process DSN Monitor SDR*

   All input data shall be logged on magnetic tape in a format suitable for playback on the 360/75, or for use as input to the 360/75 post-processor program

2. *Output process digital TV displays*

   DTV displays will be available over computer-driven channels, allowing, for example, simultaneously, display of the same information for several tracking stations. Many of the displays have more than one selectable format, allowing the grouping of display parameters as subsets. The displays fall into three basic groups:
   (a) DSN operations
   (b) Facility operations
   (c) System operations

   Each contains a spectrum of displays and format, ranging from gross status and alarming to detailed status and performance data for troubleshooting. By procedurally controlling the assignment of displays to the DTV channels, the number of tracking stations that are simultaneously monitored is selectable to all DSN stations with digital instrumentation system (DIS II) monitor capability.

3. *Output Process Monitor Alarms*

   All monitor alarms are printed on TTY character printers in the DSN area of the SFOF. Alarms are also displayed on DTV adjacent to the anomalous parameter

C. *Internal Processing*

Internal processing of monitor data is restricted to:

1. Display definition
2. Formatting for displays
3. Routing of display data
4. Conversion of monitor input parameters for display purposes
5. Comparison of real-time data with MCD sets to yield alarms (see Part III)

*Part II—360/75 Processors for Other Systems*

The mission-dependent processor supplies to the mission-independent system accounting and status information on all telemetry tracking and command streams currently being processed or logged.

*Part III—Monitor Criteria Data Control Program*

The purpose of monitor criteria data (MCD) sets is to provide facility configuration and tolerance masks against which subsystem configuration and performance can be compared. Configurations different from the one defined by the MCD set, or parameter variations larger than the tolerances in the MCD set cause an alarm.

*Part IV—Data Summaries*

This part of the program uses a monitor data file as input and generates summary reports.

1. *Input Processing*
   (a) Input process the data from file
   (b) Input process control cards via magnetic tape
2. *Output Processing*
   Output process on to 1443 line printer in DSN Operations Area and into Ops control output router for transmission to DSS

*Part V—DSN Status MDR*

This part of the program accepts and time-merges replayed monitor data from the facilities on to the monitor SDR. When all available data have been merged, the monitor SDR becomes the DSN status MDR.

[a]Does not apply to prototype DSIF Tracking System DTS at DSS 14.

## Table 3. DSN operations control system (Fig. 4)

EQUIPMENT CAPABILITIES

A GCF HSD Lines: one-half of full duplex 4800 bps line with 1200-bit data blocks

B DSIF Processor for Operations Control Messages: shared computer with other DSS functions

C SFOF/DSN real time and nonreal-time processor: redundant IBM 360/75's shared with other system processing and project processing

D Non-real Time Processor: single Univac 1108 in scientific computer facility (SCF), controlled by DSN; project analysis software and DSN Simulation System software only

E Project MSA: except as noted for display of DSN status (data flow paths ⑦ and ㉙ ), applies to both local and remote MSAs. (Systems Development Laboratory is defined as local MSA.)

F DSN simulation subsystem: shown for reference only. (See simulation system description for capabilities.)

SOFTWARE CAPABILITIES

a *Telemetry Predicts: (For MM'71, obtained from project analysis program[a] and transferred to 360 via tape)*

A. *Output Process*

1. Predicted downlink AGC as a function of time
2. Predicted subcarrier SNRs as a function of time
3. Items 2 and 3 are functions of spacecraft data mode
4. Other parameters are contained in TPAP output (such as uplink AGC) but are not extracted by DSN

ⓑ *SFOF General Purpose Program in Master Control and User Interface Subsystem to Format Outbound Blocks*

A. *Input Processing*

1. Tracking predicts from tracking system software
2. Telemetry predicts from telemetry predicts analysis program (TPAP) (MM'71 only[a])
3. DSN MCD sets from DSN monitor real-time software
4. DSN seven-day schedule software output
5. DSN SOE software output

B. *Internal Processing*

1. Accept data in formats defined by data source
2. Format HSD blocks in formats defined by Document 820-13

C. *Output Processing*

Route HSD blocks to SFOF Comm Terminal

ⓒ *DSN Seven-Day Schedule Program*

A. *Input Processing*

1. Accept midrange schedule as base schedule
2. Accept real-time change requests

B. *Internal Processing*

1. Modify seven-day schedule in accordance with approved real-time change requests
2. Tabulate listing of DSN resources committed at any point in time
3. Tabulate status of uncommitted resources at any point in time
4. Tabulate history of real-time changes to Seven-Day Schedule for selectable intervals

C. *Output Processing*

1. Transfer Seven-Day Schedule to Master Control and User Interface Subsystem (Program *b* above) for transmission to remote sites
2. Output items ⓒ to DTV for display to DSN operation via closed-circuit Television
3. Transfer seven-day schedule to DSN sequence of events (SOE) program for use as constraints (see ⓓ below)
4. Create historical file (tape) of DSN SOE resources as actually used

ⓓ *DSN SOE PROGRAM*[b]

A. *Input Processing*

1. Accept all supported projects' SOEs in machine language
2. Accept card and manual inputs to build or modify sequences
3. Accept card, manual, and machine language inputs (e.g., Tracking predicts to build or modify a subsequence library)
4. Accept card, manual and machine language inputs (e.g., seven-day schedule in ⓒ B. 3. above) to build or modify a constraints library
5. Accept card and manual inputs to define or modify format of outputs

B. *Internal Processing*

1. Identify all events which are keyed as "triggers" and insert subsequence(s) appropriate for each such event
2. Insert event time for each event in a subsequence; fixed delta-T if so defined, or use round-trip light time (RTLT), obtained via interface with tracking predicts if delta-T is trajectory dependent
3. Sort and time-order resulting master multimission sequence
4. Check resulting master multimission sequence against library of constraints (e.g., seven-day schedule for simultaneous mutually exclusive events)

C. *Output Processing*

1. Real-time alarms to SOE program operator of constraints violations
2. Uniquely identify each production run so that the "most recently produced" SOE for a given period of support operations can be easily and clearly recognized.
3. Output to 1443's in DSN Operations Area in SFOF and via master control and user interface subsystem (MCUIS) and HSDL to remote sites
4. Tailor outputs to individual users by suppressing predefined unwanted data from master multimission sequence
5. Output a predefined format to digital television system for display to DSN Operations via CCTV
6. Create historical file (tape) of each SOE production run

ⓔ *DSIF Page Prints of Operations Control Information*

A. *Input Processing*

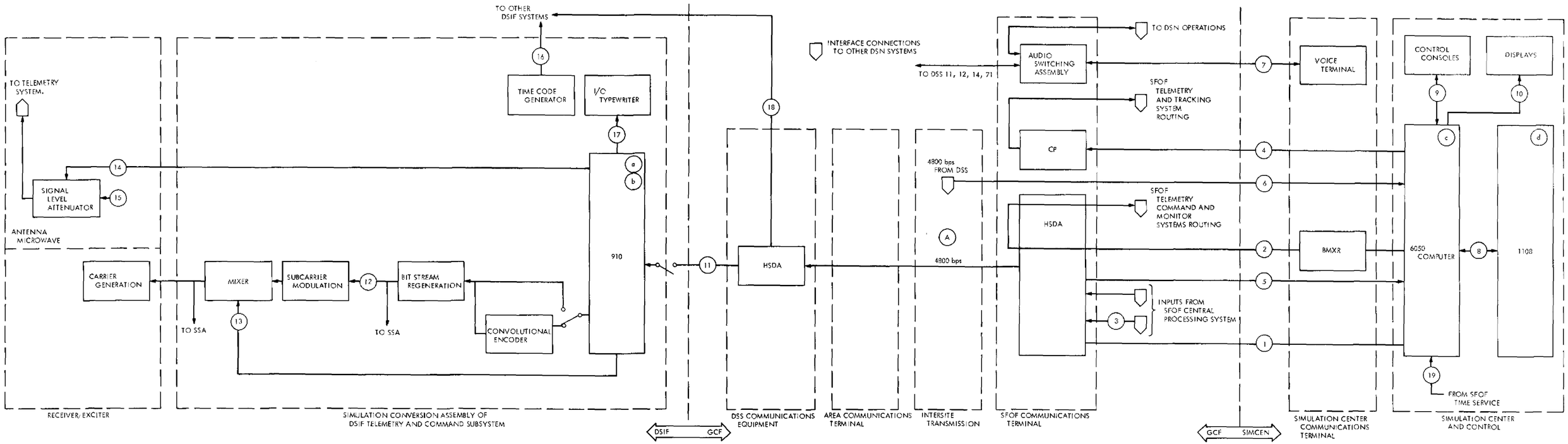
1. Accept incoming HSD blocks
2. Check for blocks in errors by means of GCF error code
3. Check for mission blocks by consecutiveness of HSD block serial numbers

## Table 3 (contd)

| | |
|---|---|
| B. *Internal Processing*<br>1. Format for output to 132-column-line printer<br>C. *Output Processing*<br>1. Produce page prints<br>2. Flag received lines suspected of errors<br>3. Insert dummy lines flagging suspected missing lines | B. *Internal Processing*<br>1. Create master data bank<br>2. Update individual discrepancy report entries if new data is input relative to that discrepancy report<br>3. Invoke security measures to protect discrepancy report data<br>C. *Output Processing*<br>1. Output periodic reports to predefined recipients in predefined formats<br>2. Output special reports in a format which is determined by recipient in near-real time<br>3. Create historical tape file of data no longer needed in the active data bank |
| (f) *DSN discrepancy report (DR) Data Bank (Off-line Process with SCF Software)*<br>A. *Input Processing*<br>1. Accept (DR) data manually transferred from discrepancy report forms to IBM cards<br>2. Accept instructions on format of output | |

[a]To be replaced by DSN multimission telemetry predicts program prior to *Pioneer F* support operations

[b]This program is multimission. It is used by supported projects in data files assigned to them.




DATA FLOW PATHS

(1) SIMULATED DATA FORMATTED FOR HSDA TRANSMISSION, TO ANY DSS (LONG-LOOP MODE), AND CONSISTING OF THE FOLLOWING:

a. TELEMETRY DATA BLOCKS (16 TO 2048 bps DATA RATES)

b. BIT RATE, SUBCARRIER FREQUENCY, ATTENUATION AND MODULATION INDEX CONTROL INFORMATION

c. SIMULATION INSTRUCTIONS

NOTE: DUPLICATED AT ANY GIVEN TIME FOR TWO OTHER DSSs (INCLUDING CTA 21, DSS 71) OR MSFN

(2) SIMULATED DATA FORMATTED FOR HSDA TRANSMISSION, SIMULATING OUTPUT OF ONE DSS TO SFOF (SHORT-LOOP MODE), AND CONSISTING OF THE FOLLOWING:

a. TELEMETRY DATA BLOCKS (16 TO 2048 bps DATA RATES)

b. MONITOR DATA

c. COMMAND TRAFFIC

d. PARTIAL STATUS AND SUPPLEMENTAL DATA

e. HIGH-SPEED TRACKING DATA (DSSs 11, 14, 42, 61 SIMULATION ONLY)

NOTE: DUPLICATED FOR TWO OTHER DSS

(3) SFOF MESSAGES TO DSIF SYSTEMS MULTIPLEXED ON 10 HIGH-SPEED DATA LINE

(4) TTY FORMATTED SIMULATED TRACKING DATA REPRESENTING UP TO THREE DSSs

(5) COMMAND AND STANDARD AND LIMITS RECEIVED FROM SFOF WHEN SIMULATION SYSTEM IS SIMULATING DSS

NOTE: DUPLICATED FOR TWO OTHER DSSs

(6) COMMAND AND MONITOR TRAFFIC FROM DSS, ALSC SCA DISPLAY (IF FROM DSS 11, 42, OR 61) PARALLEL-ROUTED TO 6050 (DUPLICATED FOR TWO OTHER DSSs)

(7) VOICE TRAFFIC TO DSIF FOR TEST COORDINATION AND TO DSN OPERATIONS FOR SIMULATION OF VARIOUS DSS OPERATING POSITIONS

(8) DATA TRANSFER FROM 1108 MATH MODEL TO 6050, AND CONTROL INFORMATION IN BOTH DIRECTIONS

(9) PROCESSING CONTROL INFORMATION

(10) SELECTED DATA AND SYSTEM STATUS

(11) HIGH-SPEED DATA BLOCKS CONTAINING DATA TYPES LISTED, NOTE (1), ITEMS a, b, c.

(12) CODED (32 TO 4096 sps) OR UNCODED (16 TO 2048 bps) TELEMETRY DATA STREAM

(13) MIXING RATIO (MODULATION INDEX) CONTROL

(14) S-BAND CARRIER ATTENUATION CONTROL

(15) S-BAND EQUIVALENT OF ONE SPACECRAFT DOWNLINK (WITHOUT DOPPLER)

(16) BINARY-CODED DECIMAL TIME CODE FOR USE THROUGHOUT DSS

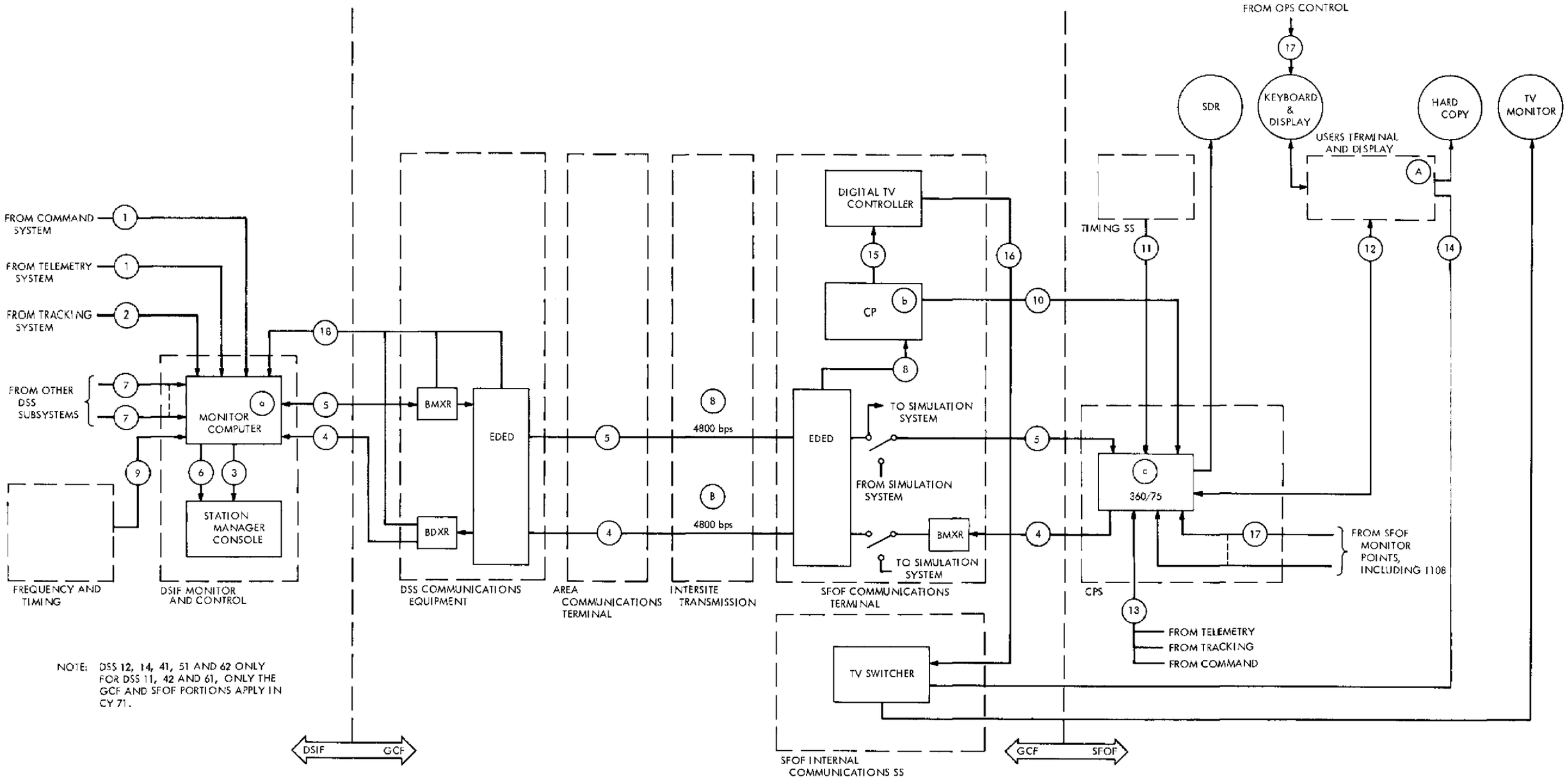
(17) SIMULATION INSTRUCTIONS AND SIMULATION CONVERSION ASSEMBLY CONTROL AND DISPLAY

(18) COMMANDS TO TCP, MONITOR STANDARDS AND LIMITS TO DIS, AND TRAFFIC TO OTHER DSIF SYSTEMS FROM SFOF

(19) SIMULATED GMT AND INTERVAL TIMING INTERRUPT

(A) AND (a) TO (d) DEFINED IN TABLE I

**Fig. 1. DSN simulation system for *Pioneers F and G* at the 26- and 64-m antenna stations**




NOTE: DSS 12, 14, 41, 51 AND 62 ONLY
FOR DSS 11, 42 AND 61, ONLY THE GCF AND SFOF PORTIONS APPLY IN CY 71.

DATA FLOW PATHS

(1) DSIF TELEMETRY SYSTEM AND COMMAND SYSTEM ALARMS AND STATUS (DOES NOT INCLUDE DECOMMUTATED SPACECRAFT DATA)

(2) DSIF TRACKING SYSTEM DATA, STATUS, AND ALARMS

(3) DSIF ALARMS FOR CORRECTIVE ACTION BY STATION MANAGER (NO GCF STATUS DATA OR ALARMS)

(4) DSS INSTRUMENT STANDARDS AND LIMITS (PREDICTS)

(5) DSS STATUS DATA; INCLUDES ALL DATA PROCESSED BY DSS MONITOR COMPUTER EXCEPT ALARMS FROM DSS INSTRUMENT STANDARDS AND LIMITS

(6) DSS TRACKING SYSTEM ALARMS FROM TRACKING ERROR DETECTION FUNCTION LOCATED IN MONITOR COMPUTER

(7) INSTRUMENT STATUS FROM OTHER DSS SUBSYSTEMS

(8) GCF HSD INSTRUMENT ALARMS FOR ALL HIGH-SPEED TRAFFIC INBOUND TO SFOF

(9) TIME

(10) GCF INSTRUMENT STATUS AND DATA STATUS TO 360/75

(11) TIME

(12) MONITOR PROGRAM/OPERATOR INTERPLAY, PLUS STATUS DISPLAYS

(13) DATA ALARMS GENERATED WITHIN SFOF, TRACKING, TELEMETRY, AND COMMAND SYSTEMS, AND PERIODIC PROCESSING STATUS MESSAGES. INCLUDES DECOMMUTATED S/C TELEMETRY.

(14) VIDEO IMAGES OF DIGITAL DISPLAYS

(15) GCF INSTRUMENT ALARMS FORMATTED FOR GCF CONTROL TV DISPLAY

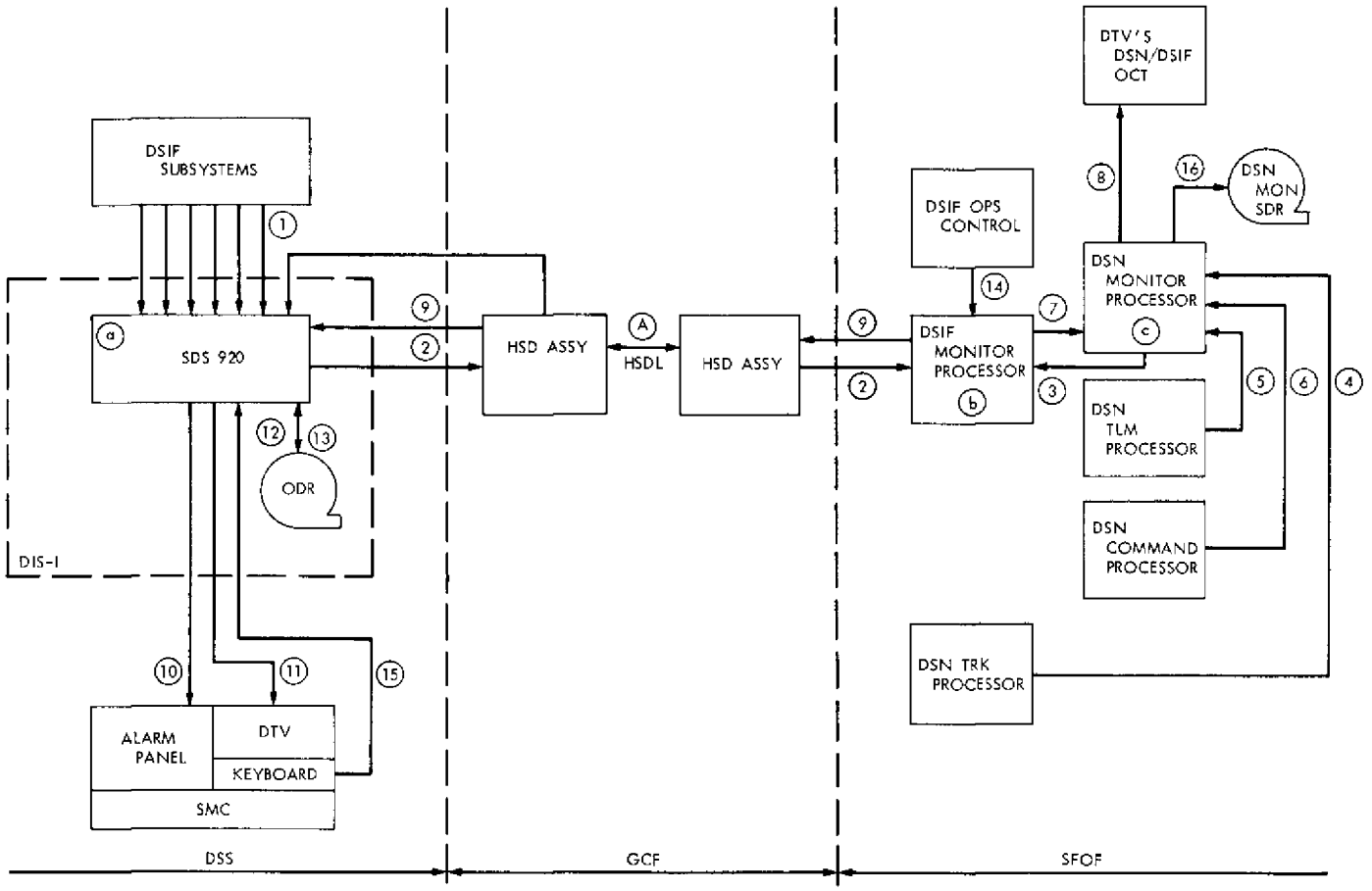
(16) GCF ALARM DISPLAY FOR CORRECTIVE ACTION BY GCF CONTROL

(17) SFOF MONITOR DATA, BOTH 360/75 AND 1108

(18) SELECTED GCF STATION HSDA TERMINAL MONITOR DATA FOR RETURN TO SFOF

(A) AND (B) AND (a) TO (c) ARE DEFINED IN TABLE 2

**Fig. 2. DSN monitoring system for *Pioneers F and G* at SFOF, GCF, and DSSs 12, 14, 41, 51, and 62**




DATA FLOW PATHS

(1) RAW MONITOR DATA INPUTS
(2) RAW MONITOR DATA HSD BLOCKS
(3) SELECTED DSN MONITOR; INCLUDES PSEUDO-RESIDUALS, DECOMMUTED TELEMETRY
(4) PROCESSED TRACKING DATA AND ALARMS
(5) TELEMETRY SYSTEM MONITOR MESSAGES
(6) COMMAND SYSTEM MONITOR MESSAGES
(7) PROCESSED DSIF MONITOR DATA AND ALARMS
(8) MONITOR DTV DISPLAYS FOR DSIF/DSN OCT
(9) PROCESSED DSIF MONITOR DATA TO ORIGINATING DSS; INCLUDES DATA IN (3)
(10) ALARM SIGNALS TO STATION MONITOR AND CONTROL CONSOLE (SMC) ALARM PANEL
(11) DTV DISPLAYS
(12) NON-REAL TIME DUMP OF DSIF MONITOR ODR
(13) RAW MONITOR DATA TO LOG TAPE (ODR)
(14) OPERATION CONTROL OF DSIF PROCESSOR IN 360/75
(15) STATION MONITOR CONTROL FROM KEYBOARD
(16) DSN MONITOR SDR

EQUIPMENT/SUBSYSTEM CAPABILITIES

(A) ONE 4800-bps FULL-DUPLEX LINE PER DSS, SHARED BY ALL SYSTEMS; 1200-BIT BLOCK SIZE

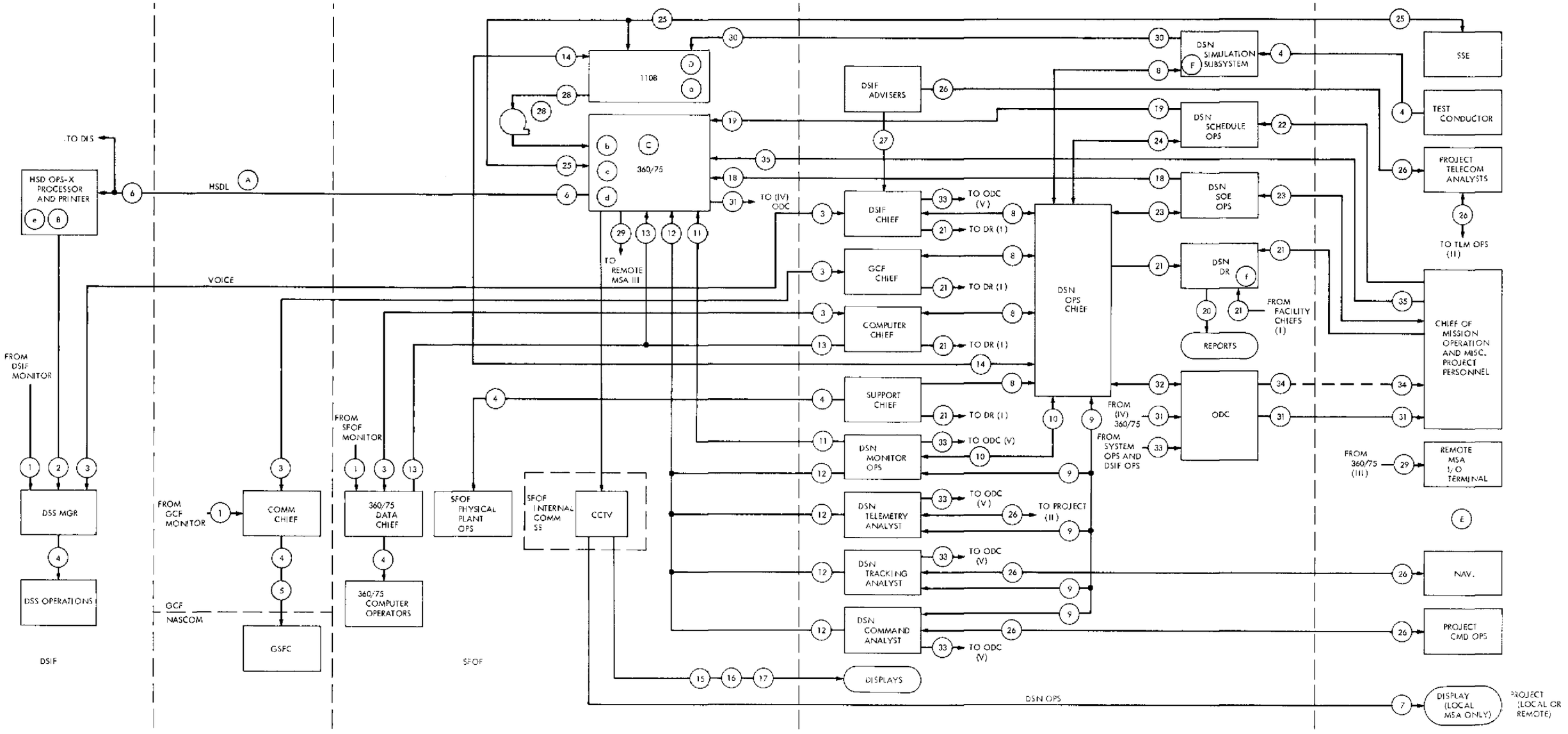
SOFTWARE CAPABILITIES

(a) DSIF MONITOR BACKFEED DIS PROGRAM (TO BE ADDED)
(b) DSIF MONITOR PROGRAM IN 360/75 (TO BE ADDED)
(c) DSN MONITOR PROGRAM

A. THIS PROGRAM IS THE SAME AS THAT WHICH DESCRIBED SOFTWARE CAPABILITY, ITEM (c), OF THE MONITOR SYSTEM, AS CONFIGURED FOR DSSs 12, 14, ETC, BUT WITH THE ADDITION OF THE FOLLOWING:

1. OUTPUT PROCESS SELECTED DSN MONITOR DATA TO THE DSIF PROCESSOR IN THE 360/75. THIS DATA WILL INCLUDE PSEUDO-RESIDUALS AND SELECTED DECOMMUTATED S/C TELEMETRY.
2. INPUT PROCESS DSIF MONITOR DATA BLOCKS FROM THE DSIF MONITOR PROCESSOR IN THE 360/75. BLOCK FORMAT AND RATE ARE IDENTICAL TO THOSE RECEIVED VIA HSDA LINE FROM DSS 12, 14, ETC.

**Fig. 3. DSN monitoring system for *Pioneers F and G* at SFOF, GCF, and DSSs 11, 42, and 61**




DATA FLOW PATHS

(1) FACILITY STATUS AND ALARMS FOR ACTION AT FACILITY OPERATION SUPERVISOR'S INITIATIVE
(2) PAGE PRINTS OF DSIF OPERATION CONTROL DATA, e.g., SEQUENCE OF EVENTS (SOE), DSIF (S AND L)
(3) FACILITY INTERNAL ACTIVITY COORDINATION
(4) OPERATIONAL DIRECTION
(5) RESOURCE REQUIREMENTS AND COMMITMENTS
(6) HSDA BLOCKS OF DSIF OPERATIONS CONTROL DATA AND DSIF S AND L, e.g., SOE, PREDICTS
(7) DSN MONITOR DISPLAY FOR DSN OPERATION OF "DSN STATUS INFORMATION FOR PROJECT" (LOCAL MSA ONLY)
(8) FACILITY INTERFACE ACTIVITY COORDINATION
(9) SYSTEM DATA STATUS, TROUBLESHOOTING ADVICE, DATA RECALL REQUIREMENTS
(10) COORDINATION OF NETWORK S AND L
(11) REAL-TIME CONTROL OF NETWORK S AND L (LIMITED TO DSIF IN CY 71 AND 72
(12) CONTROL OF EACH SYSTEM DATA PROCESSOR, INCLUDING MDR
(13) CONTROL OF 360/75
(14) COORDINATION OF 1108 CONTROL
(15) DSN MONITOR DISPLAYS FOR DSN OPERATION
(16) DSN MONITOR DISPLAYS FOR FACILITY OPERATION
(17) DSN MONITOR DISPLAYS FOR SYSTEMS OPERATION
(18) CONTROL OF SOE SOFTWARE
(19) CONTROL OF SCHEDULING SOFTWARE (SKED S, W)
(20) REPORTS ON DISCREPANCY REPORT (DR) DATA VIA OFFLINE PROCESSING FOR MANAGEMENT, DSN OPERATION, FACILITY OPERATION, SYSTEMS OPERATION
(21) REPORTING OF RECOVERY OPERATIONS
(22) PROJECT RESOURCE AND SUPPORT REQUIREMENTS
(23) COORDINATION OF SEQUENCE PLANNING
(24) COORDINATION OF REAL-TIME CHANGES OF SUPPORT REQUIREMENTS
(25) CONTROL OF PROJECT ANALYSIS PROGRAMS IN 1108 AND 360/75
(26) TECHNICAL INFORMATION EXCHANGE
(27) SPECIALIZED ADVISORY SUPPORT (NOT OPERATIONAL DIRECTION)
(28) TELEMETRY PREDICTS FROM TELEMETRY PREDICTS ANALYSIS PROGRAM (TRAP[a]), VIA TAPE INTERFACE
(29) SAME DSN MONITOR DATA AS (7), BUT FORMATTED FOR ROUTING TO REMOTE MSA I-O TERMINAL IN MACHINE LANGUAGE
(30) CONTROL OF DSN SIMULATION SOFTWARE IN 1108
(31) TRACKING, TELEMETRY AND COMMAND MDRs
(32) COORDINATION OF PHYSICAL TRANSFER OF MDRs TO PROJECT
(33) INPUTS TO DSN PASS FOLDERS
(34) PASS FOLDERS AVAILABLE (ORIGINAL FOR CURRENT DAY, MICROFILM FOR HISTORICAL FOLDERS) FOR PROJECT PERUSAL. MAY SEND TO PROJECT IF SO NEGOTIATED AS INTERFACE.
(35) CONTROL OF SOE GENERATION PROGRAM IN 360/75 BY PROJECT
(A) TO (F) AND (a) TO (f) ARE DEFINED IN TABLE 3

[a] SEE NOTES ON (a) AND (b) IN "SOFTWARE CAPABILITIES"

**Fig. 4. DSN operations control system for *Pioneers F and G***